Central Coast Juvenile Herring Survey, August 2002

S. Henderson, T.W. Therriault, C.W. Haegele, J. Schweigert, and M. Thompson

Fisheries and Oceans Canada
Science Branch, Pacific Region
Pacific Biological Station
Nanaimo, British Columbia
V9T 6N7

2004

Canadian Manuscript Report of Fisheries and Aquatic Sciences 2687

Fisheries and Oceans / Pêches et Océans

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Canadian Manuscript Report of Fisheries and Aquatic Sciences

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104-07280/

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Cat. No Fs 97-4/2687E ISSN 0706-6473

Correct citation for this publication:

Henderson, S., Therriault, T.W., Haegele, C.W., Schweigert, J., and Thompson, M. 2004. Central coast juvenile herring survey, August 2002. Can. Manuscr. Rep. Fish. Aquat. Sci. 2687: 33 p.

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ABSTRACT

Henderson, S., Therriault, T.W., Haegele, C.W., Schweigert, J., and Thompson, M. 2004. Central coast juvenile herring survey, August 2002. Can. Manuscr. Rep. Fish. Aquat. Sci. 2687: 33 p.

The first juvenile herring survey in the Central Coast of British Columbia was conducted August 11-24, 2002. Thirty-eight stations were sampled within Statistical Management Areas 6, 7, 8 and 9, from Meyers Passage in the north, to Fish Egg Inlet in the south. The survey was designed to assess the possibility of forecasting recruitment to the Central Coast herring stock from estimates of juvenile abundance during their first year of life. The survey also addresses information gaps on the distribution, abundance, size and feeding habits of juvenile herring. Plankton samples and herring stomach contents also were collected at each site. Locations with a history of herring spawn were selected as the primary sampling sites. At each sampling location, sites that represented nearshore and open water habitats were selected for sampling.

Over 21 species of fish were recorded in the purse seine catches with herring being the most frequently captured species. A total of 7349 juvenile herring were measured and weighed. The length frequency distribution was distinctly bimodal, representing two herring age groups: 0+ and 1+. Age 0+ herring occurred in 97.4% of the sets, and 1+ herring occurred in 60.5% of the sets. Age 2+ herring occurred in only four sets, all in negligible amounts. About 500 herring stomachs were examined. The dominant food item of 0+ herring was copepods and 1+ herring principally preyed upon adult euphausiids.

RÉSUMÉ

Henderson, S., Therriault, T.W., Haegele, C.W., Schweigert, J., and Thompson, M. 2004. Central coast juvenile herring survey, August 2002. Can. Manuscr. Rep. Fish. Aquat. Sci. 2687: 33 p.

Un premier recensement portant sur les stocks de harengs juvéniles de la partie centrale de la côte de la Colombie-Britannique a été effectué entre les 11 et 24 août 2002. Vingt-huit endroits ont été échantillonnés dans les zones de gestion statistique 6, 7, 8 et 9 comprises entre le passage Meyers au Nord et le bras de mer to Fish Egg Inlet au sud. Le recensement avait pour objet de déterminer s'il est possible de prévoir le recrutement des stocks de hareng dans la partie centrale de la côte à partir des chiffres d'abondance des cohortes d'un an. Le recensement visait également à mieux informer les données portant sur la distribution, l'abondance, la taille et les habitudes alimentaires des harengs juvéniles. Des échantillons de plancton et de contenu stomacal de spécimens de harengs ont également été recueillis dans les principaux sites d'échantillonnage. Pour chaque lieu d'échantillonnage, on a choisi des sites représentatifs d'habitats littoraux et d'habitats d'eaux libres.

Plus de 21 espèces de poissons ont été enregistrées dans les prises ramenées par les sennes, le hareng étant l'espèce la plus représentée. Au total, 7 349 harengs juvéniles ont été mesurés et pesés. La distribution statistique des tailles était nettement bimodale, distinguant deux types de cohortes : celle de moins d'un an (97,4 % des traits) et celle de plus d'un an (60,5 % des traits). Des sujets de plus de 2 ans ont été observés dans seulement quatre traits, et en très petit nombre. Les contenus stomacaux d'environ 500 sujets ont été examinés. L'aliment principal trouvé chez les moins d'un an était constitué par les copépodes alors que chez les plus d'un an on trouvait principalement des euphausiacés adultes.

INTRODUCTION

Pacific herring (*Clupea pallasi*) is an important commercial and forage species in British Columbia. Herring spawn on marine vegetation in the subtidal and upper intertidal zone between February and June, with peak spawning during March and April (Humphreys and Hourston 1978). The eggs hatch in two to three weeks and the larvae disperse with surface currents, metamorphosing into juvenile herring at a length of ~25mm (Hay and McCarter 1997). Juvenile herring are generally found nearshore, along with juvenile salmon and other species of fish (Hay et al. 1989a). Herring are considered juvenile until they are three years of age and have joined the sexually mature spawning population (Hay and McCarter 1999).

Beginning in 1990, surveys of juvenile herring have been conducted in the Strait of Georgia and Johnstone Strait (Haegele 1997) to assess the relative abundance and distribution of juvenile herring as a predictor of recruitment to the adult population in future years. Additionally, data on plankton and herring feeding habits were collected. However, relatively little is known of juvenile herring biology and ecology in other parts of British Columbia. Therefore, a survey similar to those conducted in the Strait of Georgia was adapted for the Central Coast of British Columbia (Fig. 1), encompassing Statistical Management Areas 6-9. The survey was designed to assess the relative abundance of juvenile herring in this region and to collect basic biological data. Plankton samples were taken at each set location and retained for analysis; juvenile herring stomach contents also were examined from most set locations. This survey potentially will provide a better understanding of the role and relationships juvenile herring have in Central Coast waters, and may provide an empirical forecast of recruitment to the herring roe fishery based on relative juvenile abundance.

METHODS

Herring sections in the Central Coast stock assessment area with a record of herring spawnings (Hay et al. 1989b,c) were selected as the primary sampling sites. Within each section, fishing locations representing nearshore and open water habitats were selected for sampling. All sampling was done after dusk and prior to dawn, and consisted of purse seine sets, either preceded or followed by plankton tows.

The 2002 Central Coast juvenile herring survey took place from August 11-24. Thirty-eight sets were made at 12 locations within Statistical Management Areas 6, 7, 8 and 9. The study area extended from Meyers Passage in the north, to Fish Egg Inlet in the south (Fig. 2).

FISH SAMPLING

The 12m, aluminium-hulled Fisheries Research Vessel WALKER ROCK was used for all fishing. All sets were made with a 183m x 27m purse seine net of knotless web, resulting in a circular area fished of ~2665m^2 (net diameter was ~58m). The body of the

net had 46m of 22.2mm mesh at the tow end, followed by 91m of 19.0mm mesh. The bunt was 46m of 9.5mm mesh. The net, when pursed, fished to a depth of 10m, and was able to retain fish greater than 30mm in length. All fishing was done after dusk when herring are feeding near the surface. The locations of the sets were predetermined, and sets were made without prior information on fish presence or abundance (i.e. acoustic echosounding). Up to four sets were made per night, depending on location and weather conditions. Generally, all of the catch was landed, but when this was not practical, then one tote of about 40kg of mixed fish species was landed and the remainder estimated (number of totes released over the corkline). Landed catches were sorted to species (and herring further sorted to year-class based on visual estimation) and weighed. The 0+ and 1+ herring year-classes were usually easily recognized due to the distinct size differences at each age. Samples of 200 or more herring from each year-class (if present), were preserved in 3.7% seawater formalin for later analysis at the Pacific Biological Station. Time between landing and preservation was 5-15 minutes and most fish were alive or recently dead at the time of preservation. Fish were measured for length (standard length for herring and fork length for juvenile salmon) and weight 8-12 weeks after preservation. Impacts from preservation should have been constant for all samples.

PLANKTON SAMPLING

A stepped oblique plankton tow was performed for each purse seine set (n = 38). The tows always were completed after dusk and immediately before or after a set. Paired 19cm diameter bongo nets with 350μm mesh were used for sampling, resulting in 'left' and 'right' bongo plankton samples. The bongos were lowered to 20m (10m in shallow areas) and raised by an electric winch at a rate of 1m every 15 seconds (or 1m every 30 seconds for shallow areas). A General Oceanics® 2030R model flowmeter was attached to the left bongo to determine the volume of seawater filtered through the bongos during sampling. Volume filtered was calculated using the following equation (McCarter and Hay 2002):

$$\mathbf{V = (A \cdot F \cdot K) / 999{,}999}$$

Where:

V = volume of water filtered through the plankton net (m^3)
A = area of net opening ($0.02835 m^2$)
F = number of revolutions recorded by the flow meter (end reading – start reading)
K = standard speed rotor constant for 7cm rotor (26,873)

Once the tow was complete, the organisms in the bongo nets were washed out with a deck hose, and the samples preserved in 3.7% seawater formalin. In the laboratory, a volumetric splitter was used to reduce sample size to a point where organisms could be conveniently counted in a counting tray under 30X magnification. Plankters generally were not identified to species but classified into broad taxonomic categories, except for copepods, which were identified to species when possible. Densities are expressed as plankters·m^{-3}.

STOMACH CONTENTS

Approximately 500 juvenile herring stomachs from 34 sets were retained for gut content analysis. Up to ten fish from each age-class were retained from the preserved samples for stomach content analysis. Each stomach was rated for fullness (empty, trace, half full and full), state of digestion (fresh, partly, mostly and totally) and, when possible, its contents identified and counted. Stomach contents were categorized into 28 groups of organisms from 10 phyla, with copepods classified to species when possible.

RESULTS

A total of 38 sets were made during the 2002 survey; four in section 091 (Fish Egg Inlet), four in section 085 (Kwakshua Channel), five in section 076 (Kildidt Sound), four in section 074 (Thompson Bay), six in section 067 (Laredo Inlet), four in section 077 (Milbanke Sound), six in section 072 (Powell Anchorage), four in section 073 (Bella Bella) and one in section 084 (Burke Channel) (Fig. 2). Section numbers and names correspond to the classification by Midgley (2003), and may not necessarily match the individual set location names (Table 1).

Over 21 species of fish were recorded in the 38 seine catches. Herring were encountered most frequently. Other species common (>15% occurrence) in seine sets included: walleye pollock, osmerids (mostly capelin), coho salmon, pink salmon, chinook salmon and shiner perch. Squid (possibly opal squid) also were encountered in many sets (Tables 2 and 3).

HERRING

A total of 7349 herring were measured and the length frequency distribution was bimodal, making it possible to identify two distinct age classes based on length (Fig. 3). For the Central Coast in 2002, the age class-length designations were:

0+ = any herring less than or equal to 87mm in length
1+ = any herring between 88mm and 150mm in length
2+ or older = any herring greater than or equal to 151 mm in length.

Length frequency distributions for herring at each set location are shown in Figure 4. The histograms display the length frequency for sampled herring only, and do not represent the total herring catch in any one location. The number of juvenile herring caught in each set was determined by dividing the total catch weight by the age-specific mean weight of sub-sampled herring from each age class. The number of other species caught was determined in the same manner, with juvenile and adult salmon treated separately to minimize errors when calculating total catch (Table 2).

Age 0+ herring occurred in 97.4% of the sets (Table 3). The largest catches of 0+ herring by weight occurred in Spiller Channel (section 072), Kwakshua Channel (section 085) and Thompson Bay (section 074). Table 4 shows the mean and total weights for 0+ and

1+ herring for each set location. The mean length of all sampled 0+ herring was 53.6 mm, and the mean weight was 1.79g.

Age 1+ herring were encountered less frequently than 0+ herring, occurring in only 60.5% of the sets (Table 3). The largest catches of 1+ herring occurred in Kwakshua Channel (section 085), Fish Egg Inlet (section 091) and Hunter Channel (section 073) (Table 4). No 1+ herring were caught in Spider Anchorage, Meyers Passage, Kitasu Bay or Burke Channel. The mean length of all sampled 1+ herring was 120.0mm, and the mean weight was 22.92 g.

Age 2+ herring occurred in only four sets, all in negligible amounts.

The relationship between weight and length for all sampled herring was determined by fitting a logistic function to the length-weight data (Fig. 5):

Herring age-class	Relationship	Number of fish sampled	Coefficient of determination
0+	$W = 9.81 \times 10^{-6} L^{3.041}$	n = 6369	$R^2 = 0.9595$
1+	$W = 2.57 \times 10^{-6} L^{3.335}$	n = 970	$R^2 = 0.9390$
2+	n/a	n/a	n/a
All classes	$W = 5.00 \times 10^{-6} L^{3.186}$	n = 7349	$R^2 = 0.9876$

PLANKTON

There were 25 categories of organisms in 10 phyla identified in plankton samples and juvenile herring stomachs (Table 5). Copepods were identified to species, where possible (Table 6). We identified 19 calanoid and 2 cyclopoid species in the samples (Table 7) with unidentified calanoid, harpacticoid, monstrilloid and caligoid copepods also present.

An average of 17.0 m^3 (n = 38, SD = 1.65) of water was filtered per tow. Copepods occurred in all samples. Coelenterates, shrimp zoea, crab zoea and megalopea, and the calanoid copepods *Centropages abdominales*, *Acartia longiremis* and *Pseudocalanus* sp. occurred in >80% of samples. Ctenophores, polychaetes, cladocerans, barnacle larvae, amphipods, euphausiid larvae and adults, chaetognaths, larvaceans, eggs, and the calanoid copepods *Calanus* sp., *Calanus marshallae* and *Metridia pacifica* occurred in 50-80% of samples. Siphonophores, gastropods, isopods, ectoprocts, fish larvae, the caligoid copepods *Eucalanus bungii*, *Calanus pacificus*, *Epilabidocera longipedata* and *Tortanus discaudatus*, the cyclopoid copepod *Oithona* sp. and unidentified caligoid copepods occurred in 25-49% of samples. Pteropods, pelecypods, ostracods, squid juveniles and octopus larvae, insects, mites, echinoderms, the calanoid copepods *Eucalanus elongatus*, *Neocalanus cristatus*, *Candacia columbiae*, *Chiridius gracilis*, *Aetidius pacificus* and *Paracalanus parvus*, and unidentified harpacticoid and monstrilloid copepods occurred infrequently (Table 7).

STOMACH SAMPLES

A total of 349 stomachs from 0+ herring were examined. Of these, 108 were empty and 58 had totally digested contents (Table 8). Identifiable food items were present in 183 herring stomachs (Table 9). Copepods and turbellarians occurred as food items for 0+ herring from all locations. The calanoid copepods *Acartia longiremis, Pseudocalanus* sp., *Tortanus discaudatus, Paracalanus parvus, Metridia pacifica* and *Calanus marshallae,* and the cyclopoid copepod *Oithona* sp. occurred most frequently. Other frequently encountered food items were eggs, barnacle larvae, euphausiids, and crab larvae.

A total of 147 stomachs from 1+ herring were examined. Of these 23 were empty and 21 had totally digested contents (Table 8). Identifiable food items were present in 103 stomachs. Adult euphausiids were the dominant food item in herring from all but one section (Table 10). Turbellarians occurred in all sections and may have been benthic due to the absence of flatworms in the plankton samples. Copepods were food items in all but two locations, but only the calanoid *Metridia pacifica* occurred frequently. Two of the stomachs from Powell Anchorage (Set 9) contained 0+ herring.

SUMMARY

The 2002 Central Coast juvenile herring survey took place from August 11-24, and included 38 sets at 12 locations within Statistical Management Areas 6, 7, 8 and 9. The purpose of the survey was to assess the relative abundance of juvenile herring as an empirical predictor of future recruitment to the roe fishery. A secondary goal was to address information gaps about the general biology and ecology of herring, especially juveniles, in the Central Coast. In addition to juvenile herring, plankton samples from each set location were retained for analysis. Some herring stomachs also were removed for comprehensive content analysis. It was found that the dominant food item of 0+ herring was copepods and 1+ herring predominantly preyed upon adult euphausiids.

A Central Coast juvenile herring data base has been established, and with the addition of data from future surveys in the Central Coast, a more comprehensive understanding of juvenile herring in this previously under-studied northern area will be possible.

ACKNOWLEDGMENTS

This study was funded by the Herring Conservation and Research Society (HCRS), and we are grateful for their continuing support. All plankton and herring stomach samples were processed by Carol Cooper and Al Hirst of AMC Technical Services. Bob Armstrong of Armstrong Biotech Services and Christa Hrabok assisted with the field sampling. Carla Haegele performed laboratory and data entry work. Fisheries and Oceans supplied the research vessel and all laboratory facilities. Kristen Daniel provided editorial comments regarding ArcView© maps. Doug Hay provided editorial comments.

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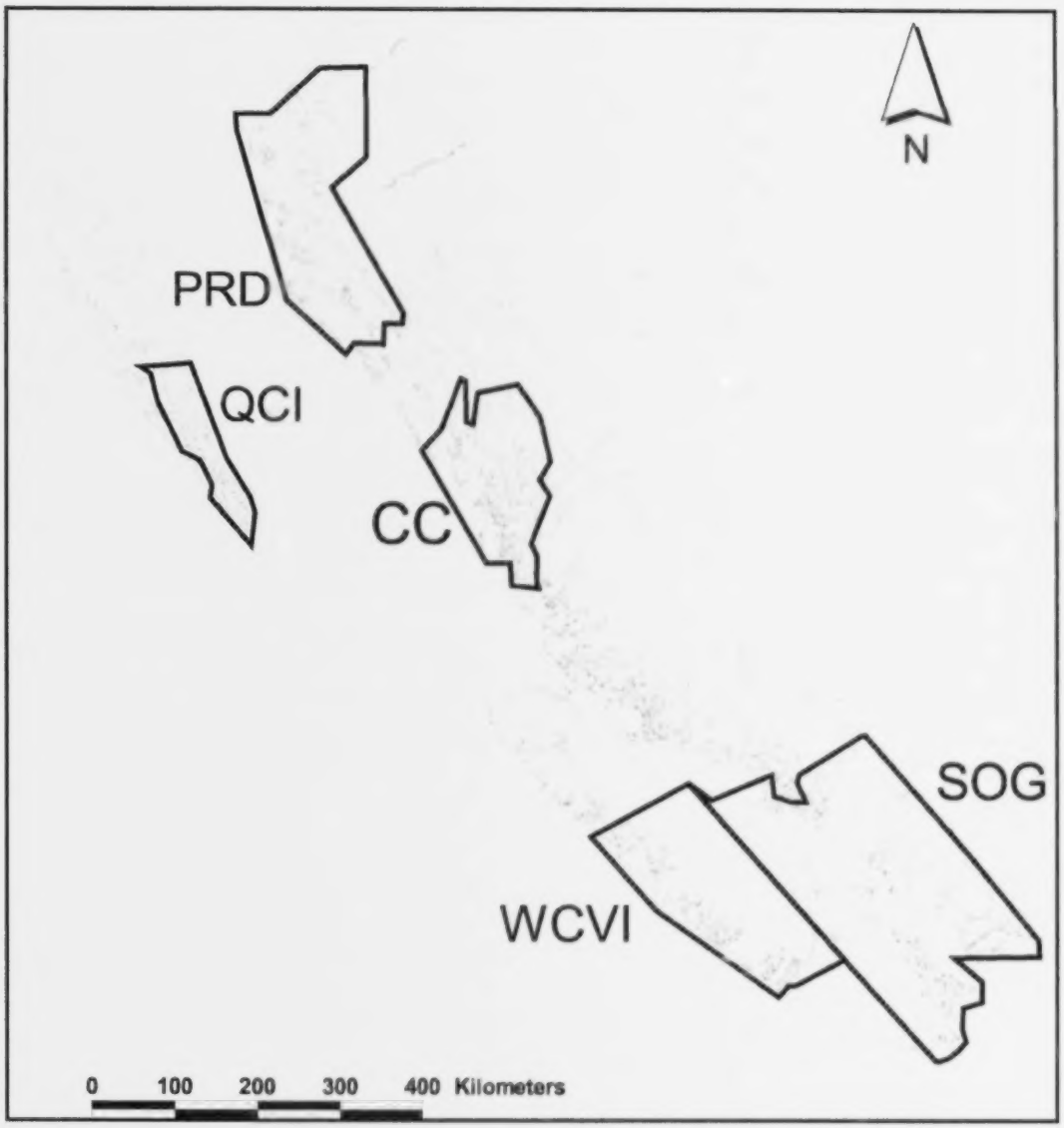


Figure 1. The five major British Columbian herring stock assessment regions: Prince Rupert District (PRD), Queen Charlotte Islands (QCI), Central Coast (CC), west coast Vancouver Island (WCVI) and the Strait of Georgia (SOG).

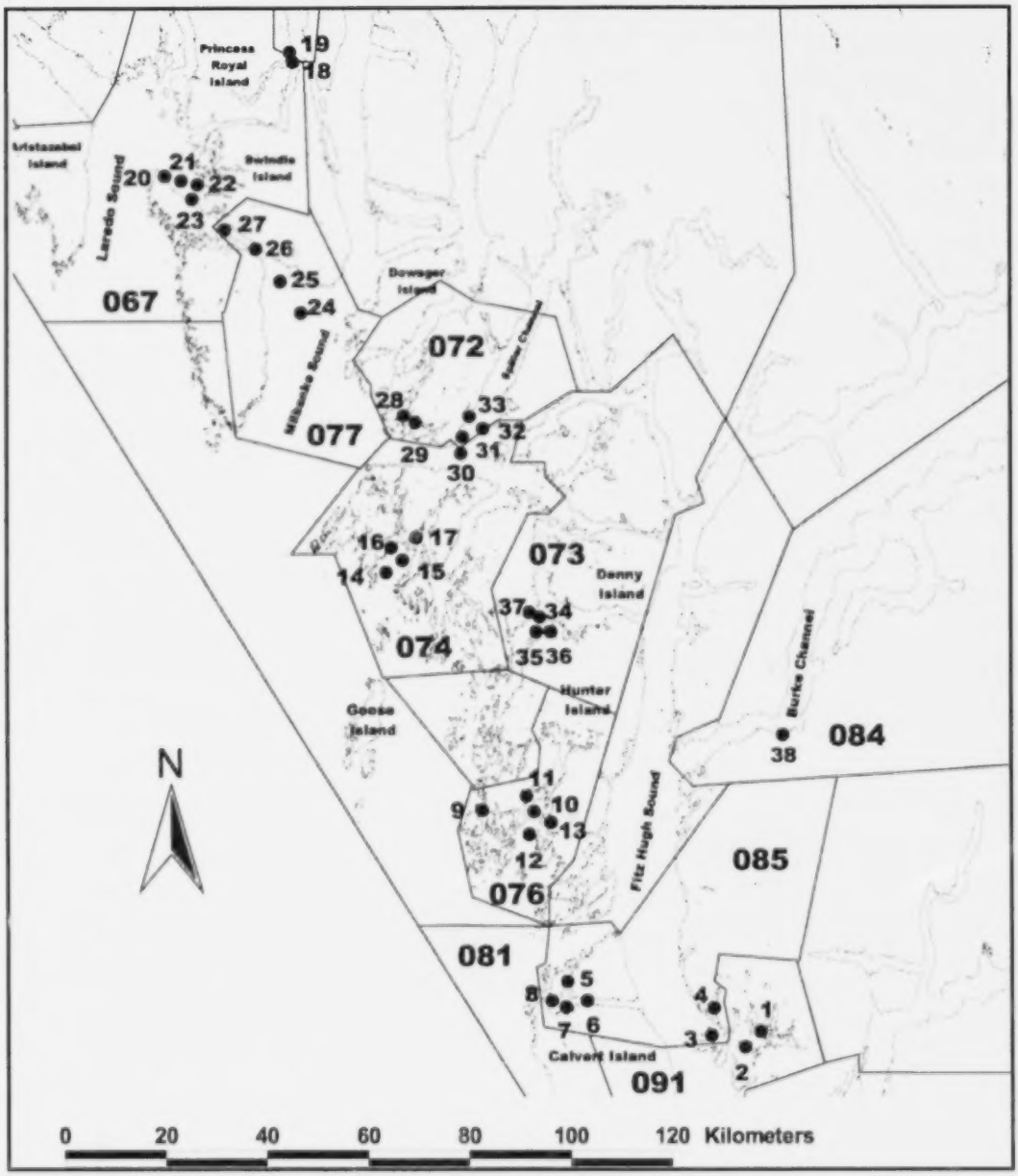


Figure 2. Central Coast set locations and corresponding herring sections (larger 3-digit numbers).

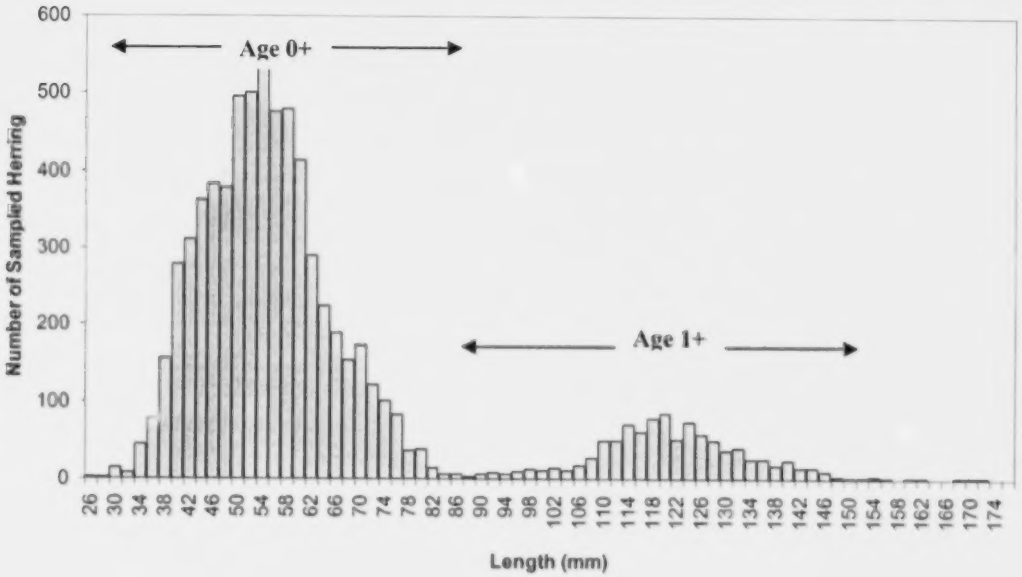


Figure 3. Two distinct age classes, corresponding to ages 0+ and 1+, in the length-frequency distribution of all sampled herring.

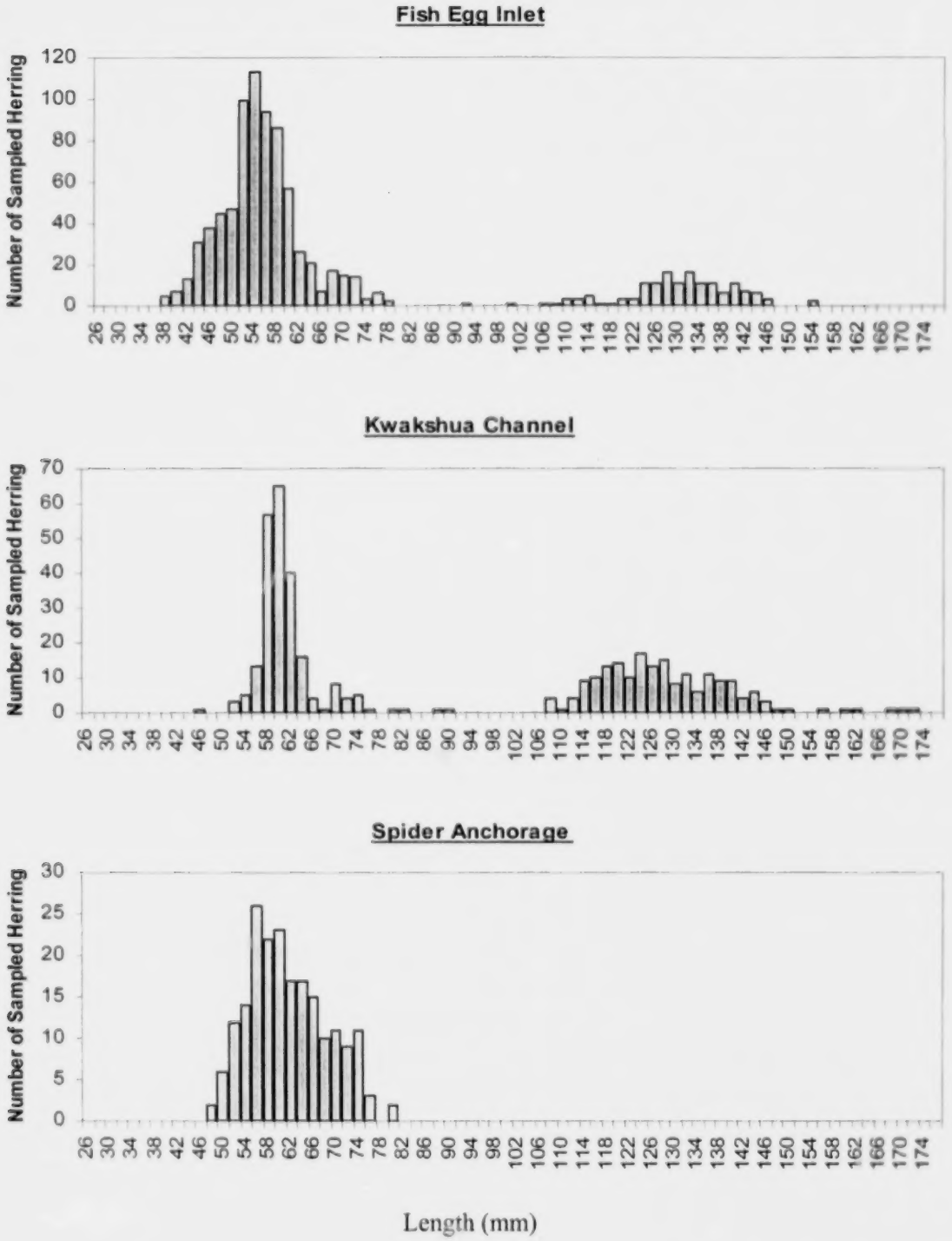
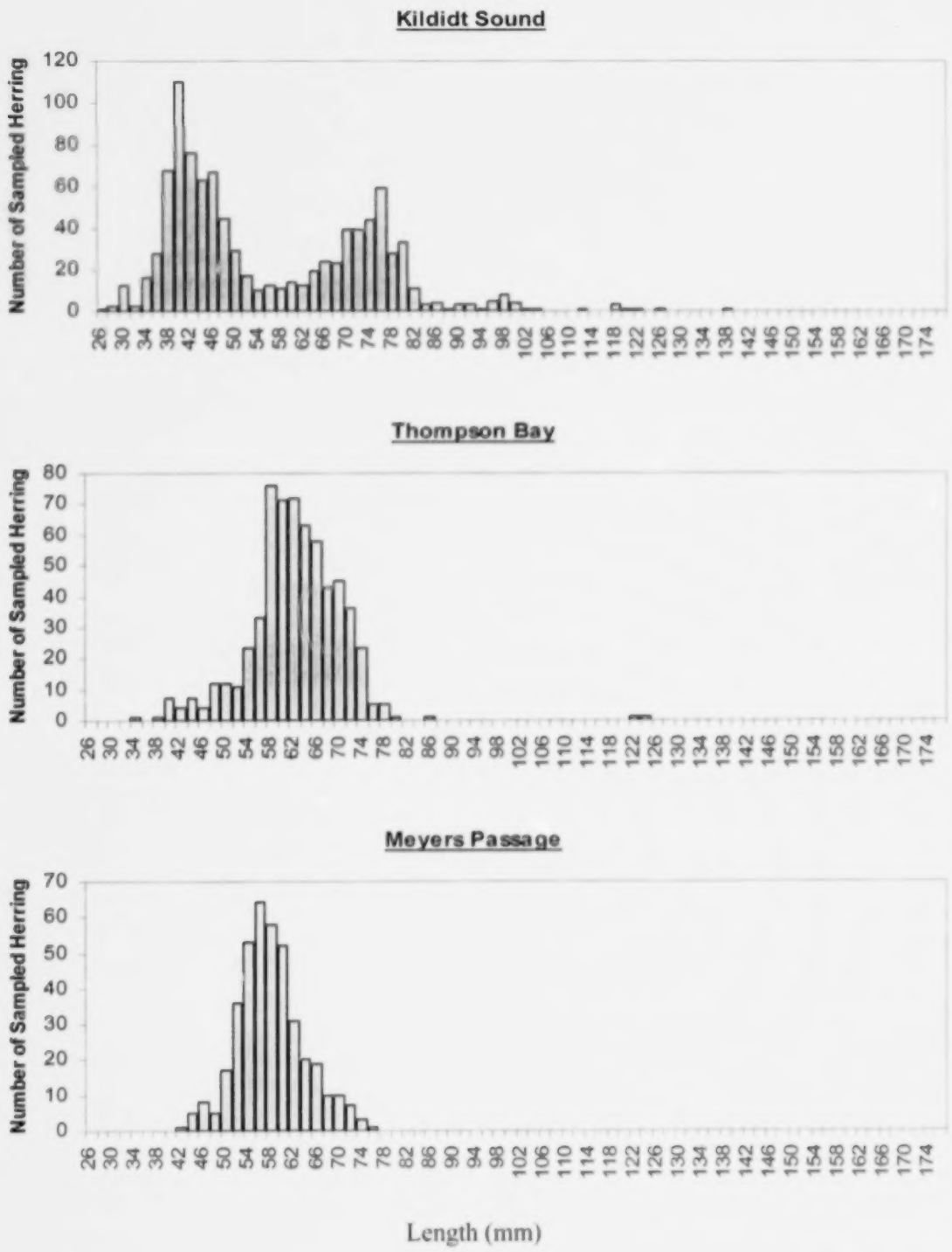


Figure 4. Length frequency distributions of sampled herring by location. The number of sets at each location and the herring section corresponding to set locations is provided in Table 1.



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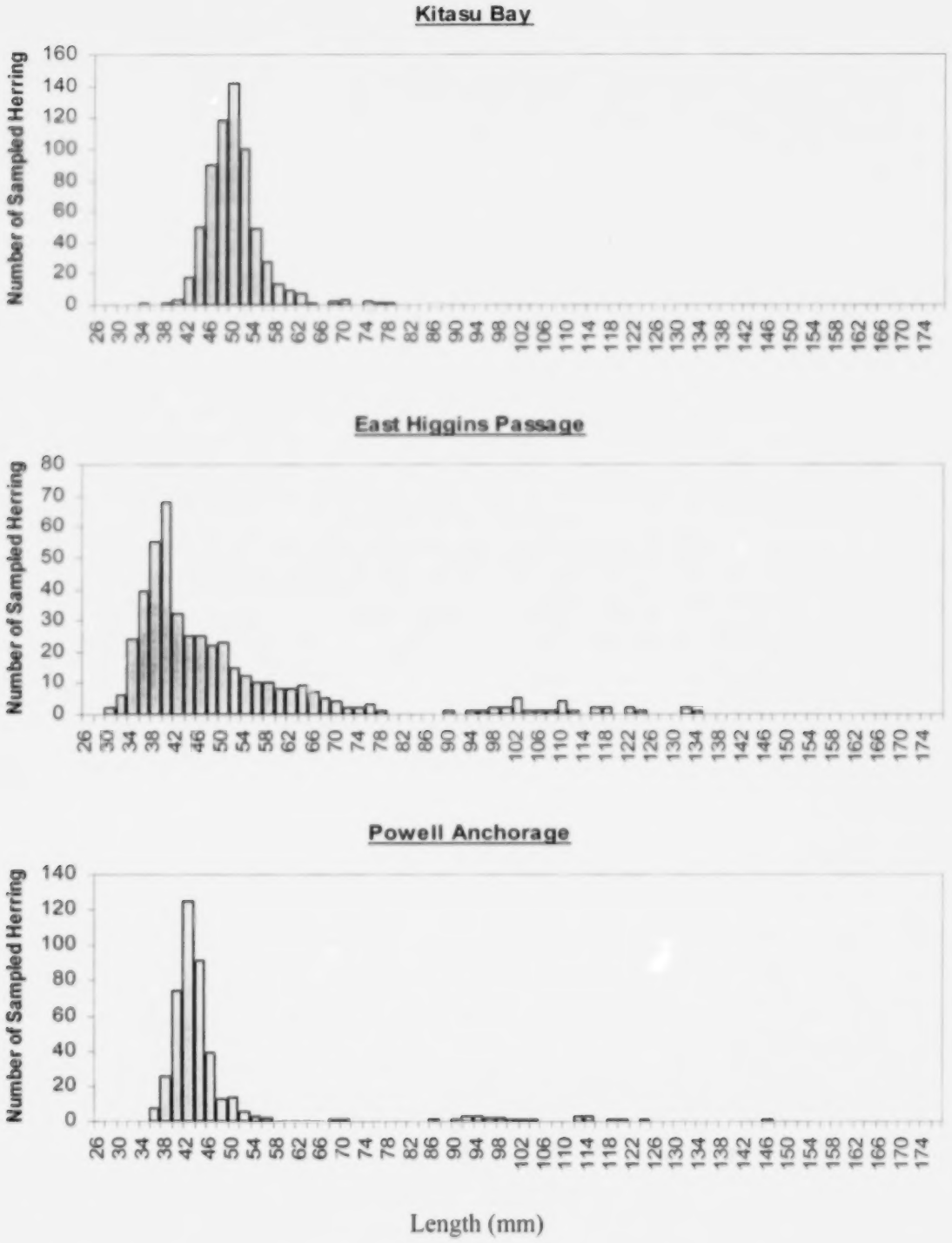

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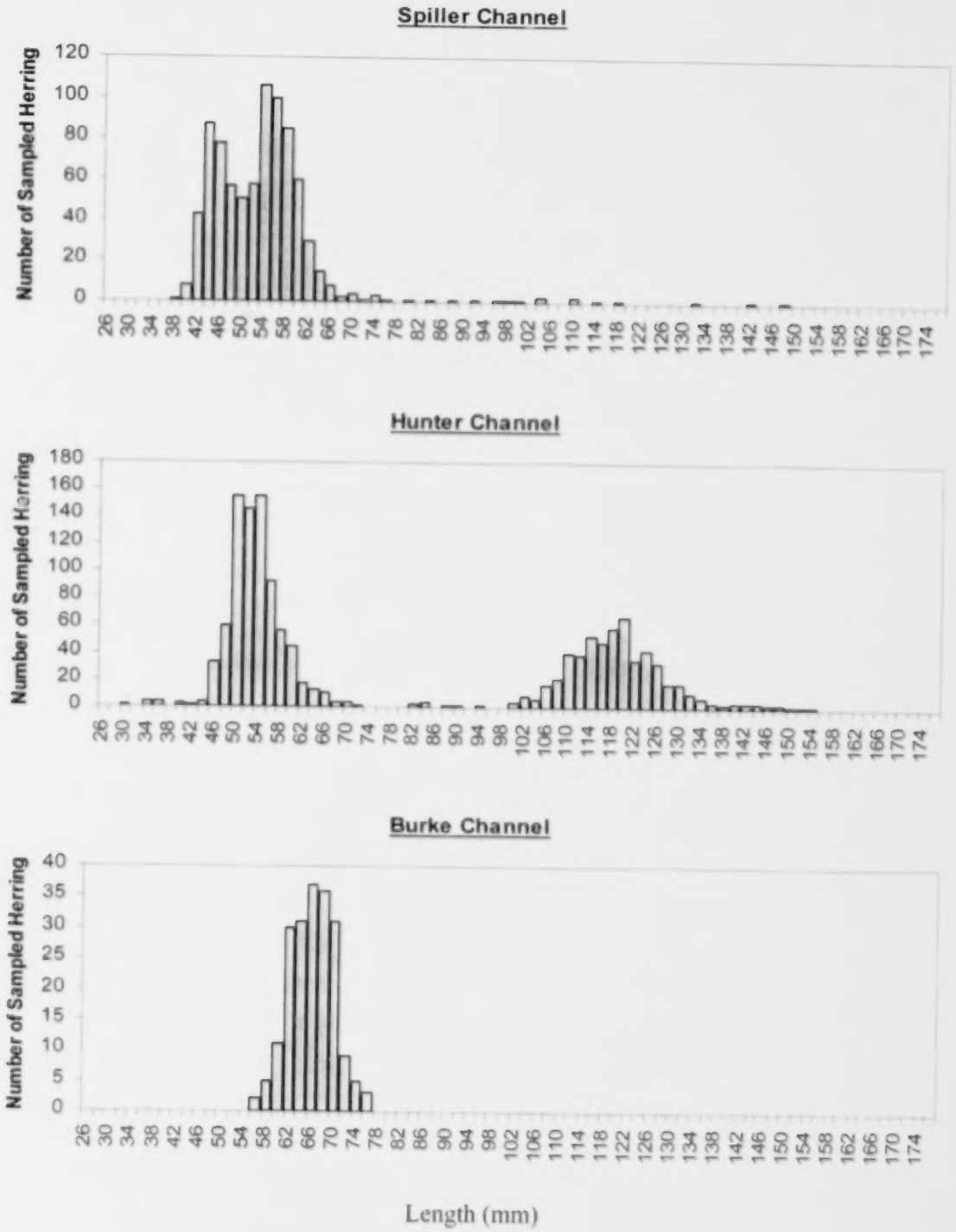
Spiller Channel
Number of Sampled Herring
Hunter Channel
Number of Sampled Herring
Burke Channel
Number of Sampled Herring
Length (mm)

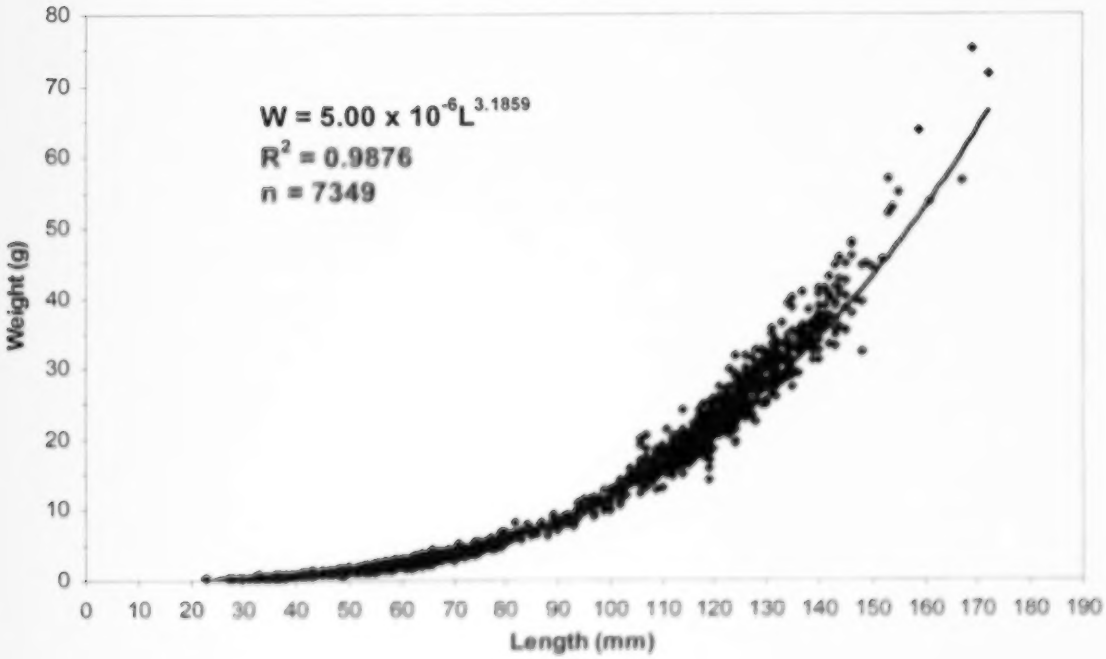

Figure 5. Length-weight relationship for all sampled herring.

Table 1. Set information for the 2002 Central Coast juvenile herring survey, including dates, set times and location details.*

Set	Start Date	Loc. Code	Station	Section	Set Location Name	Decimal degree latitude (N)	Decimal degree longitude (W)	Set Time (PST)
1	Aug-11	1	1	091	Fish Egg Inlet	51.621	127.745	22:00
2	Aug-11	1	2	091	Fish Egg Inlet	51.604	127.773	23:12
3	Aug-11	1	3	091	Fish Egg Inlet	51.617	127.832	00:50
4	Aug-11	1	4	091	Fish Egg Inlet	51.647	127.828	02:50
5	Aug-12	2	1	085	Kwakshua Ch.	51.676	128.088	22:00
6	Aug-12	2	2	085	Kwakshua Ch.	51.655	128.053	23:00
7	Aug-12	2	3	085	Kwakshua Ch.	51.648	128.091	00:00
8	Aug-12	2	4	085	Kwakshua Ch.	51.655	128.115	01:20
9	Aug-13	3	1	076	Spider Anch.	51.863	128.238	22:12
10	Aug-14	4	1	076	Kildidt Sound	51.862	128.146	21:30
11	Aug-14	4	2	076	Kildidt Sound	51.879	128.159	23:20
12	Aug-14	4	3	076	Kildidt Sound	51.837	128.154	00:50
13	Aug-14	4	4	076	Kildidt Sound	51.850	128.116	01:40
14	Aug-16	5	1	074	Thompson Bay	52.121	128.407	21:30
15	Aug-16	5	2	074	Thompson Bay	52.134	128.378	22:45
16	Aug-16	5	3	074	Thompson Bay	52.148	128.398	00:05
17	Aug-16	5	4	074	Thompson Bay	52.159	128.354	01:05
18	Aug-17	6	1	067	Meyers Passage	52.673	128.572	21:50
19	Aug-17	6	2	067	Meyers Passage	52.684	128.577	00:45
20	Aug-18	7	1	067	Kitasu Bay	52.550	128.800	22:00
21	Aug-18	7	2	067	Kitasu Bay	52.545	128.771	23:10
22	Aug-18	7	3	067	Kitasu Bay	52.541	128.742	00:20
23	Aug-18	7	4	067	Kitasu Bay	52.525	128.751	01:15
24	Aug-19	8	1	077	E. Higgins Pass	52.402	128.558	21:50
25	Aug-19	8	2	077	E. Higgins Pass	52.436	128.595	22:55
26	Aug-19	8	3	077	E. Higgins Pass	52.471	128.638	00:15
27	Aug-19	8	4	077	E. Higgins Pass	52.492	128.693	01:15
28	Aug-20	9	1	072	Powell Anch.	52.291	128.376	22:00
29	Aug-20	9	2	072	Powell Anch.	52.284	128.355	22:45
30	Aug-21	10	1	072	Spiller Channel	52.250	128.274	22:00
31	Aug-21	10	2	072	Spiller Channel	52.268	128.271	22:35
32	Aug-21	10	3	072	Spiller Channel	52.277	128.235	23:55
33	Aug-21	10	4	072	Spiller Channel	52.290	128.259	00:30
34	Aug-23	11	1	073	Hunter Channel	52.057	128.115	21:50
35	Aug-23	11	2	073	Hunter Channel	52.057	128.141	22:35
36	Aug-23	11	3	073	Hunter Channel	52.073	128.135	23:45
37	Aug-23	11	4	073	Hunter Channel	52.078	128.153	00:40
38	Aug-24	12	1	084	Burke Channel	51.945	127.704	21:40

Section	Name	Section	Name
067	Laredo Inlet	077	Milbanke Sd.
072	Powell Anch.	084	Burke Ch.
073	Bella Bella	085	Kwakshua Ch.
074	Thompson Bay	091	Fish Egg Inlet
076	Kildidt Sd.		

*Location names do not always follow the official name of the herring management sections they are located in. Herring management section names are listed on the left.

Table 2. Species * weights and quantity by set.

Set	Location	Species	Total Species Weight (g)	Number of Fish
1	Fish Egg Inlet	**0+ herring**	468	293
		1+ herring	70	4
		Walleye pollock	10	2
		Pacific sandlance	6	6
		Poacher	10	14
		Three-spine stickleback	12	26
		Pacific sardine	138600	630
2	Fish Egg Inlet	**0+ herring**	29600	17412
		1+ herring	60	4
		Shrimp	5	2
		Chinook salmon	44	2
		Walleye pollock	15	3
		Shiner perch	215	26
		Three-spine stickleback	82	82
		Smelt sp.	2063	1474
3	Fish Egg Inlet	**0+ herring**	13300	6045
		1+ herring	31200	1033
		2+ herring	105	2
		Coho salmon	72	1
		Pink salmon	1400	1
		Walleye pollock	15	3
4	Fish Egg Inlet	**0+ herring**	16000	13333
		1+ herring	225	20
5	Kwakshua Channel	**0+ herring**	5	2
6	Kwakshua Channel	**0+ herring**	3	1
		Pacific sardine	10500	474
7	Kwakshua Channel	**0+ herring**	113000	47083
		Squid	150	10
8	Kwakshua Channel	**0+ herring**	52	23
		1+ herring	33000	1260
		2+ herring	983	6
		Starry Flounder	1200	1
		Rockfish sp.	210	2
		Squid	3500	177
9	Spider Anchorage	**0+ herring**	7400	2741
		Capelin	9	1
		Squid	40	2
10	Kildidt Sound	**0+ herring**	955	258
		1+ herring	105	7
		Coho salmon	706	5

Table 2 (cont'd)

Set	Location	Species	Total Species Weight (g)	Number of Fish
10	Kildidt Sound	Pink salmon	8600	6
		Walleye pollock	55	8
		Chum salmon	135	1
		Squid	3000	109
		Spiny Dogfish	31600	210
11	Kildidt Sound	**0+ herring**	563	268
		1+ herring	143	14
		Walleye pollock	5	1
		Squid	5	2
12	Kildidt Sound	**0+ herring**	906	951
		1+ herring	89	5
		Pink salmon	400	1
		Coho salmon	600	1
		Chinook salmon	800	1
13	Kildidt Sound	**0+ herring**	2740	2022
		1+ herring	214	12
		Lingcod	40	1
		Chinook salmon	70	1
		Squid	60	4
		Prickleback	10	10
		Smelt sp.	10	10
		Walleye pollock	704	107
14	Thompson Bay	**0+ herring**	121000	43214
15	Thompson Bay	**0+ herring**	18100	5656
		1+ herring	22	1
		Spiny dogfish	8100	3
16	Thompson Bay	**0+ herring**	191400	73615
		Walleye pollock	15	2
17	Thompson Bay	**0+ herring**	33	14
		1+ herring	22	1
		Shiner perch	15	1
		Walleye pollock	25	6
		Squid	2200	108
18	Meyers Passage	**0+ herring**	1200	667
		Three-spine stickleback	10	2
		Capelin	5	5
19	Meyers Passage	**0+ herring**	143000	71500

Table 2 (cont'd)

Set	Location	Species	Total Species Weight (g)	Number of Fish
20	Kitasu Bay	**0+ herring**	4500	3214
		Pacific Tomcod	1100	0
		Sculpin	10	1
		Squid	30	1
		Pink salmon	1900	1
		Coho salmon	500	2
21	Kitasu Bay	**0+ herring**	3600	2571
		Squid	60	4
		Chinook salmon	763	5
		Coho salmon	2400	13
		Walleye pollock	440	176
22	Kitasu Bay	**0+ herring**	20970	16131
23	Kitasu Bay	**0+ herring**	38	38
		Squid	60	2
		Shiner perch	30	7
24	East Higgins Passage	Pink salmon	1400	1
		Mackeral	4600	2
		Chum salmon	13500	3
25	East Higgins Passage	**0+ herring**	47	18
		1+ herring	82	5
26	East Higgins Passage	**0+ herring**	20574	15814
		1+ herring	12426	633
		Capelin	12	1
27	East Higgins Passage	**0+ herring**	3500	4795
		1+ herring	243	16
		Sole sp.	40	1
		Coho salmon	123	1
		Walleye pollock	107	38
28	Powell Anchorage	**0+ herring**	8700	11299
		1+ herring	171	15
		Pacific sandlance	2	1
		Capelin	5	1
		Prickleback	10	1
		Shiner perch	6	2
		Squid	800	40
		Walleye pollock	1070	215
29	Powell Anchorage	**0+ herring**	11200	12043
		1+ herring	167	9
		Walleye pollock	800	52
		Shiner perch	458	143

Table 2 (cont'd)

Set	Location	Species	Total Species Weight (g)	Number of Fish
30	Spiller Channel	**0+ herring**	5000	2825
		1+ herring	180	14
		Chinook salmon	159	1
31	Spiller Channel	**0+ herring**	241000	177206
		Walleye pollock	630	72
32	Spiller Channel	**0+ herring**	9100	5141
		1+ herring	137	7
		Coho salmon	158	1
		Pink salmon	1900	1
		Chinook salmon	1217	6
33	Spiller Channel	**0+ herring**	26700	27245
		1+ herring	57	3
		Shiner perch	10	3
		Walleye pollock	15	6
34	Hunter Channel	**0+ herring**	9400	6104
		1+ herring	173	9
		2+ herring	57	1
		Walleye pollock	200	24
		Capelin	1	2
35	Hunter Channel	**0+ herring**	5200	2694
		1+ herring	4700	225
		2+ herring	45	1
		Walleye pollock	10	1
		Chinook salmon	275	1
		Coho salmon	423	2
		Pink salmon	3300	2
		Smelt (unknown species)	27	27
36	Hunter Channel	**0+ herring**	3700	2372
		1+ herring	7000	324
		Coho salmon	222	1
		Chum salmon	4100	1
		Capelin	1	2
		Walleye pollock	15	3
		Chinook salmon	1440	4
		Pink salmon	14800	11
		Pacific sardine	7000	27

Table 2 (cont'd)

Set	Location	Species	Total Species Weight (g)	Number of Fish
37	Hunter Channel	**0+ herring**	31300	23185
		1+ herring	3200	137
		Shiner perch	8	3
		Walleye pollock	1509	184
		Capelin	293	293
38	Burke Channel	**0+ herring**	6100	2243
		Capelin	322	146

*Invertebrates such as euphausiids (Phylum Arthropoda), comb jellies (Phylum Ctenophora) and jellyfish (Phylum Cnidaria) were frequently encountered but not included in this table due to quantifying difficulties.

Table 3. Percent occurrence for each species* in all 2002 Central Coast sets.

Common name	Scientific name	Set Number	Percent Occurrence (%)
0+ herring	*Clupea pallasi* in year of birth	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38	97.4
1+ herring	*Clupea pallasi* in year after birth	1, 2, 3, 4, 8, 10, 11, 12, 13, 15, 17, 25, 26, 27, 28, 29, 30, 32, 33, 34, 35, 36, 37	60.5
2+ herring	*Clupea pallasi* in 2nd year or older	3, 8, 34, 35	10.5
No herring caught		24	2.6
Walleye pollock	*Theragra chalcogramma*	1, 2, 3, 10, 11, 13, 16, 17, 21, 27, 28, 29, 31, 33, 34, 35, 36, 37	47.4
Smelt sp	Family Osmeridae	2, 9, 13, 18, 26, 28, 34, 35, 36, 37, 38	28.9
Squid	*Loligo opalescens, Gonatus sp. or Berrytheuthis magister*	7, 8, 9, 10, 11, 13, 17, 20, 21, 23, 28	28.9
Coho salmon	*Oncorhynchus kisutch*	3, 10, 12, 20, 21, 27, 32, 35, 36	23.7
Chinook salmon	*Oncorhynchus tshawytscha*	2, 12, 13, 21, 30, 32, 35, 36	21.1
Pink salmon	*Oncorhynchus gorbuscha*	3, 10, 12, 20, 24, 32, 35, 36	21.1
Shiner perch	*Cymatogaster aggregata*	2, 17, 23, 28, 29, 33, 37	18.4
Three-spine stickleback	*Gasterosteus aculeatus*	1, 2, 18	7.9
Pacific sardine	*Sardinops sagax*	1, 6, 36	7.9
Chum salmon	*Oncorhynchus keta*	10, 24, 36	7.9
Pacific sandlance	*Ammodytes hexapterus*	1, 28	5.3
Spiny dogfish	*Squalus acanthias*	10, 15	5.3
Prickleback sp.	Family Stichaeidae	13, 28	5.3
Poacher sp.	Family Agonidae	1	2.6
Starry flounder	*Platichthys stellatus*	8	2.6
Rockfish sp.	*Sebastes sp.*	8	2.6
Lingcod	*Ophiodon elongatus*	13	2.6
Pacific tomcod	*Microgadus proximus*	20	2.6
Sculpin sp.	Family Cottidae	20	2.6
Chub mackeral	*Scomber japonicus*	24	2.6
Sole sp.	Family Pleuronectidae	27	2.6

*Invertebrates such as euphasiids (Phylum Arthropoda), comb jellies (Phylum Ctenophora) and jellyfish (Phylum Cnidaria) were not quantified.

Table 4. Mean lengths, mean weights and total catch weights of 0+ and 1+ herring by set location (corresponding herring management sections in brackets).

Set Location	Mean 0+ length (mm)	Mean 0+ weight (g)	Total catch weight of 0+ herring (g)	Mean 1+ length (mm)	Mean 1+ weight (g)	Total catch weight of 1+ herring (g)
Fish Egg Inlet (091)	54.5	1.66	59.4	129.4	28.95	31.6
Kwakshua Channel (085)	60.3	2.42	113.1	126.1	26.21	33.
Spider Anchorage (076)	61.2	2.70	7.4	-	-	-
Kildidt Sound (076)	53.8	2.15	5.2	101.9	14.13	.6
Thompson Bay (074)	61.6	2.83	330.5	122.5	22.10	.04
Meyers Passage (067)	57.4	1.88	144.2	-	-	-
Kitasu Bay (067)	49.5	1.32	29.1	-	-	-
East Higgins Passage (077)	44.8	1.07	24.1	109.2	16.33	12.8
Powell Anchorage (072)	42.6	0.85	19.9	104.9	14.05	.3
Spiller Channel (072)	52.0	1.47	281.8	110.6	17.42	.4
Hunter Channel (073)	53.1	1.59	49.6	118.2	21.69	15.1
Burke Channel (084)	65.5	2.72	6.1	-	-	-
All locations	**53.6**	**1.79**	**1070.4**	**120.0**	**22.92**	**93.8**

Table 5. Categories of organisms, by phylum, identified in plankton and stomach samples. The code (capital letters) is used to identify organisms in Tables 7, 9 and 10.

Coelenterata	
COEL	Medusae
SIPH	Siphonophores
Ctenophora	
CTEN	Ctenophores
Turbellaria	
TURB	Turbellarians – flatworms (parasitic flatworms included)
Annelida	
POLY	Polychaetes – segmented worms
Mollusca	
GAST	Prosobranch gastropods
PTER	Pteropods (Ophistobranch gastropods), mostly *Clione* sp.
PELE	Pelecypods
Arthropoda	
CLAD	Cladocerans; *Podon sp.* and *Evadne sp.*
OSTR	Ostracods
COPE	Copepods (See Table 6 for a list of species)
SHRI	Shrimp (natant decapod) zoea
CRAZ	Crab (reptant decapod) zoea, including porcillinadea
CRAM	Crab (reptant decapod) megalopea, including porcillinadea
BARN	Barnacle (cirriped) larvae, nauplius and cypris
SQUI	Squid juvenile and octopus larva
ISOP	Isopods, cumaceans and mysids (mostly)
AMPH	Amphipods, mostly gammarid and hyperiid, some caprellid
EUPL	Euphausiid larvae (nauplii, protozoea and zoea)
EUPA	Euphausiid adults
INSE	Insects (larvae and adults), including chironomids
MITE	Mites (larvae and adults)
Ectoprocta	
ECTO	Ectoprocts, mostly *Membranipora sp.* larvae (cyphonautes)
Echinodermata	
ECHI	Echinoderm larvae
Chaetognatha	
CHAE	Chaetognaths, mostly *Sagitta sp.*
Chordata	
LARV	Appendicularia = larvaceans, mostly *Oikopleura sp.*, and tunicate larvae
TELA	Teleost larvae
Miscellaneous	
EGGS	Unidentified pelagic eggs, polychaete or teleost

Table 6. Copepods identified in plankton and stomach samples. The code (capital letters) is used to identify organisms in Tables 7, 9 and 10.

CNAU	Unidentified copepod nauplii

Calanoid copepods

ALON	*Acartia longiremis*
APAC	*Aetidius pacificus*
CABD	*Centropages abdominales*
CALA	*Calanus* sp.
CCOL	*Cadacia columbiae*
CGRA	*Chiridius gracilis*
CMAR	*Calanus marshallae*
CPAC	*Calanus pacificus*
EBUN	*Eucalanus bungii*
EELO	*Eucalanus elongatus*
ELON	*Epilabidocera longipedata*
HTAN	*Heterorabdus tanneri*
MPAC	*Metridia pacifica*
NCRI	*Neocalanus cristatus*
NPLU	*Neocalanus plumcrus*
PMIN	*Pseudocalanus* sp.
PPAR	*Paracalanus parvus*
SMIN	*Scolethisthricella minor*
TDIS	*Tortanus discaudatus*
UCAL	Unidentified calanoids

Cyclopoid copepods

CANG	*Corcaeeus anglicus*
OITH	*Oithona* sp.
UCYC	Unidentified cyclopoids

Harpacticoid copepods

UHAR	Unidentified harpacticoids

Monstrilloid copepods

UMON	Unidentified montrilloids

Caligoid copepods

UPAR	Unidentified parasitic copepods

Table 7. Plankton tow results in number of organisms per m^3. Species codes can be found in Tables 5 and 6.

Set	Location	Water volume (m^3)	COEL	SIPH	CTEN	POLY	GAST	PTER	PELE	CLAD	OSTR	SHRI
1	Fish Egg Inlet	16.5	4.9	-	0.1	1.9	-	-	-	5.8	-	1.0
2	Fish Egg Inlet	16.3	23.7	-	0.1	15.7	-	-	-	-	-	0.4
3	Fish Egg Inlet	17.3	0.1	-	0.1	-	-	7.6	-	14.8	-	0.4
4	Fish Egg Inlet	18.0	6.8	0.1	0.1	1.8	1.8	-	-	19.5	-	0.7
5	Kwakshua Ch.	18.8	7.0	-	0.3	1.9	-	-	0.1	1.7	-	5.6
6	Kwakshua Ch.	16.3	4.0	-	0.1	-	-	-	-	-	-	0.2
7	Kwakshua Ch.	12.8	5.3	-	0.2	15.0	10.0	-	-	5.0	-	0.4
8	Kwakshua Ch.	19.0	18.0	-	0.5	6.7	6.7	-	-	50.6	-	4.7
9	Spider Anch.	16.6	15.9	-	0.4	4.0	7.7	-	-	7.7	-	29.1
10	Kildidt Sound	17.0	-	-	-	3.8	4.3	-	-	3.8	-	0.9
11	Kildidt Sound	14.7	19.2	2.5	0.2	11.0	8.7	-	-	-	-	11.7
12	Kildidt Sound	15.9	0.3	-	-	-	8.8	-	-	-	-	10.1
13	Kildidt Sound	15.1	25.3	13.9	-	0.3	-	-	-	4.2	-	10.4
14	Thompson Bay	16.4	7.9	-	-	0.1	-	-	-	3.9	-	8.2
15	Thompson Bay	15.4	0.4	-	-	-	8.3	-	-	-	-	10.0
16	Thompson Bay	17.4	3.2	1.8	-	0.1	-	-	-	-	-	2.4
17	Thompson Bay	11.2	29.7	4.0	-	5.7	-	-	-	-	-	22.3
18	Meyers Pass	16.6	0.3	-	-	-	-	-	-	-	-	1.0
19	Meyers Pass	17.6	2.4	-	-	-	0.3	-	-	-	-	0.3
20	Kitasu Bay	18.1	0.4	-	-	-	-	-	-	-	-	0.2
21	Kitasu Bay	17.1	0.2	-	-	-	-	-	-	-	-	3.9
22	Kitasu Bay	17.3	0.6	-	-	-	-	-	-	-	-	0.8
23	Kitasu Bay	19.4	2.4	-	0.3	-	-	-	-	-	-	5.7
24	East Higgins	16.2	0.1	-	-	1.2	-	-	-	-	-	0.2
25	East Higgins	16.2	-	-	-	0.2	-	-	-	-	-	0.7
26	East Higgins	16.8	0.3	-	-	-	-	-	-	-	-	0.1
27	East Higgins	17.3	6.9	0.1	0.2	-	-	-	-	-	-	8.5
28	Powell Anch.	19.0	7.1	12.1	0.4	2.1	2.5	-	-	4.6	1.1	26.9
29	Powell Anch.	17.8	21.1	9.6	0.5	2.5	1.6	-	-	2.0	-	9.5
30	Spiller Ch.	17.3	4.3	0.1	0.2	0.1	-	-	-	3.7	-	6.5
31	Spiller Ch.	17.7	0.9	1.6	0.3	-	-	-	-	5.0	-	0.3
32	Spiller Ch.	18.0	0.2	0.6	7.3	1.9	7.3	0.2	-	14.2	-	2.6
33	Spiller Ch.	18.4	0.1	2.9	0.1	0.1	-	-	-	0.4	-	1.6
34	Hunter Ch.	17.5	0.2	-	0.1	0.1	7.3	-	-	11.0	-	28.1
35	Hunter Ch.	17.3	0.1	-	-	7.4	8.3	0.3	-	7.4	-	0.7
36	Hunter Ch.	17.0	0.2	-	0.2	-	0.9	0.2	-	7.5	-	0.8
37	Hunter Ch.	19.4	-	-	0.1	0.1	3.3	-	-	3.3	-	0.6
38	Burke Ch.	18.4	0.7	0.1	-	1.1	1.1	-	-	20.3	-	-
% occurrence			92.1	34.2	55.3	63.2	44.7	10.5	2.6	55.3	2.6	97.4

Table 7 (cont'd)

Set	CRAZ	CRAM	BARN	SQUI	ISOP	AMPH	EUPL	EUPA	INSE	MITE	ECTO	CHAE	ECHI
1	0.4	-	25.2	-	-	1.0	1.0	-	-	-	14.5	0.1	-
2	-	0.2	298.7	-	-	-	-	0.2	-	-	31.4	-	-
3	0.6	0.1	44.4	-	0.1	4.2	0.3	0.5	-	-	22.2	0.2	7.4
4	11.9	0.6	60.4	-	1.9	0.1	5.3	-	-	-	16.0	0.1	-
5	8.3	0.2	59.7	-	-	1.8	1.7	-	-	-	10.2	1.8	-
6	0.1		7.8	-	-	4.0	0.3	2.0	-	-	-	0.4	-
7	15.3	1.6	74.8	-	6.5	-	5.0	0.1	-	-	24.9	-	-
8	28.2	2.3	141.8	0.1	0.9	-	10.1	-	-	-	23.6	-	-
9	31.7	1.4	11.5	-	-	0.1	15.4	0.3	-	-	11.5	0.1	-
10	31.6	2.2	-	-	-	1.9	11.3	3.4	-	-	18.8	-	-
11	65.9	0.5	45.8	-	2.3	10.9	2.2	-	-	-	37.1	-	-
12	21.9	1.8	8.1	-	-	4.0	8.1	11.6	-	-	-	0.3	-
13	100.0	3.8	23.3	-	0.6	2.1	14.9	-	-	-	69.8	-	-
14	46.8	9.8	11.7	-	3.9	1.2	20.0	3.2	-	-	-	0.1	-
15	1.5	2.9	-	-	-	2.3	9.5	8.1	-	-	-	0.8	-
16	37.4	10.5	-	-	1.8	2.1	-	5.6	-	-	-	-	-
17	62.2	12.1	-	-	2.0	0.3	-	0.4	-	0.1	-	-	-
18	0.3	0.2	3.9	-	-	-	1.9	-	-	-	1.0	-	-
19	2.1	0.1	0.1	-	-	0.2	1.8	0.3	-	-	-	-	-
20	9.1	0.3	-	-	-	-	-	-	-	-	-	0.1	-
21	19.8	10.5	-	-	-	0.1	-	0.4	-	-	-	0.1	-
22	10.3	11.3	-	0.1	-	-	-	1.3	-	-	-	-	-
23	16.0	1.7	1.7	-	0.1	-	0.4	-	-	-	0.4	-	-
24	-	-	-	-	-	8.1	-	1.2	-	-	-	0.7	-
25	0.2	-	-	-	-	0.0	-	17.8	-	-	-	-	-
26	0.5	0.8	-	-	-	3.8	-	1.4	-	-	-	-	-
27	27.5	1.6	18.5	-	-	1.9	-	-	-	-	-	-	-
28	22.5	0.3	17.9	-	0.2	0.7	0.6	-	0.2	-	0.2	0.1	-
29	13.5	0.1	12.6	-	0.2	0.7	0.4	-	0.6	-	0.2	-	-
30	12.7	0.1	81.4	-	-	0.1	7.5	1.6	-	-	-	0.2	-
31	1.8	0.4	31.7	-	-	-	1.4	-	-	-	0.9	0.5	-
32	9.2	0.5	56.8	-	-	11.8	39.1	2.4	-	-	-	0.4	0.2
33	2.0	0.1	5.9	-	0.1	1.0	3.9	0.7	-	-	-	-	-
34	27.0	1.1	80.5	-	5.5	11.3	3.7	-	-	-	-	-	-
35	8.3	0.3	89.0	-	-	1.7	-	1.2	-	-	-	0.4	-
36	2.5	0.6	161.7	-	-	12.3	11.3	1.2	-	-	-	0.8	-
37	3.5	0.6	16.5	-	-	0.1	3.3	0.6	-	-	-	0.1	-
38	0.4	0.1	5.4	-	-	-	0.3	-	-	-	-	-	-
% occurrence	97.4	89.5	73.7	5.3	36.8	73.7	71.1	60.5	5.3	2.6	42.1	50.0	5.3

Table 7 (cont'd)

Set	LARV	TELA	EGGS	CNAU	UCAL	EBUN	EELO	CALA	CMAR	CPAC	NCRI	CCOL
1	27.1	0.1	15.6	-	-	-	-	-	-	-	-	-
2	86.5	-	-	-	15.7	0.2	-	8.2	0.1	-	-	-
3	66.7	-	11.1	-	48.0	0.6	-	2.1	11.0	-	-	0.2
4	23.1	-	0.1	-	0.6	-	-	-	-	-	-	-
5	11.9	0.1	15.3	-	6.9	0.1	-	5.1	-	-	-	-
6	3.9	-	23.5	-	36.5	0.5	-	109.6	23.5	-	-	-
7	34.9	-	10.0	-	25.1	-	-	-	-	-	-	-
8	30.4	0.1	6.7	-	27.0	-	-	-	0.1	-	-	-
9	7.7	-	27.0	-	26.9	-	-	1.6	1.2	0.1	-	-
10	-	0.1	812.4	-	41.4	-	-	0.4	-	0.2	-	-
11	10.9	-	8.7	-	41.4	-	-	-	-	-	-	-
12	-	-	48.4	-	130.4	0.3	-	49.2	1.3	-	-	-
13	6.3	-	10.6	-	12.7	-	-	6.5	-	-	-	-
14	-	0.1	50.7	-	132.4	-	-	24.4	0.3	-	-	-
15	-	0.1	-	-	150.2	-	-	119.5	1.2	0.1	-	-
16	-	0.1	1.9	-	44.2	-	-	4.9	0.1	-	-	-
17	-	0.1	0.2	-	45.8	-	-	0.1	-	0.5	-	-
18	1.0	-	-	-	6.8	-	-	1.0	-	-	-	-
19	-	0.1	-	-	7.3	-	-	0.3	0.1	0.1	-	0.2
20	-	-	-	-	49.5	-	-	28.3	-	-	-	-
21	-	-	-	-	59.9	-	-	53.5	2.2	-	-	-
22	-	0.1	-	-	59.2	0.1	-	0.5	-	-	-	-
23	-	0.4	-	-	2.5	-	-	0.4	0.1	-	-	-
24	-	0.1	51.4	-	52.0	-	0.1	19.3	1.7	-	0.1	-
25	-	-	23.7	-	7.7	-	-	4.4	1.7	0.5	-	-
26	-	-	-	-	1.9	-	-	0.1	-	0.1	0.1	-
27	1.9	-	-	-	1.9	-	-	0.2	-	-	-	-
28	0.6	-	-	-	0.8	-	-	0.5	-	-	-	-
29	1.3	-	0.4	-	1.1	-	-	-	-	0.3	-	-
30	11.1	-	329.7	-	26.0	0.3	-	3.6	0.3	0.8	0.1	74.0
31	20.5	-	116.4	-	1.4	-	-	0.1	-	-	-	-
32	39.1	-	419.0	-	25.5	0.2	-	7.1	0.2	4.0	-	-
33	9.8	0.2	20.4	-	3.8	0.2	-	1.7	0.1	-	0.1	-
34	11.0	0.2	7.3	-	18.4	0.7	-	-	-	0.1	-	-
35	22.2	-	88.9	-	141.2	-	-	9.0	4.9	0.2	0.2	1.9
36	56.4	-	162.9	-	113.3	-	-	2.8	0.2	-	-	0.7
37	19.9	-	95.6	-	36.3	0.2	-	-	1.8	1.8	-	0.1
38	11.6	-	1.1	0.2	3.3	0.2	-	0.7	-	-	-	-
% occurrence	63.2	36.8	71.1	2.6	97.4	31.6	2.6	78.9	52.6	34.2	13.2	15.8

Table 7 (cont'd)

Set	ELON	MPAC	CGRA	APAC	CABD	TDIS	ALON	PPAR	PMIN	UCYC	OITH	UHAR
1	-	-	-	-	-	-	146.3	-	1.9	-	5.8	-
2	0.1	-	-	0.4	-	-	699.8	-	172.9	-	23.6	-
3	-	109.8	-	-	48.0	-	627.9	-	199.4	-	7.4	-
4	0.1	-	-	-	8.9	-	-	-	-	-	-	-
5	0.1	0.1	-	-	30.8	-	133.0	-	8.5	-	6.8	-
6	-	252.1	-	-	58.9	-	325.7	-	113.8	-	3.9	-
7	-	0.3	-	-	34.9	-	538.3	-	5.0	-	-	-
8	-	-	-	-	20.2	-	138.3	-	3.4	-	3.4	-
9	0.4	0.1	-	-	84.8	-	169.7	-	26.9	-	3.8	-
10	0.1	-	-	-	22.6	-	432.6	-	60.2	-	-	-
11	0.1	-	-	-	19.7	30.5	117.8	-	28.3	-	-	-
12	-	9.6	-	-	72.6	-	452.2	-	484.7	-	-	-
13	-	-	-	-	21.2	6.3	152.4	-	16.9	-	-	-
14	0.1	0.2	-	-	58.5	-	152.1	-	97.9	-	-	-
15	-	40.5	-	-	89.6	-	400.2	-	310.6	-	-	-
16	-	-	-	-	9.2	1.8	193.4	-	108.6	-	-	-
17	-	-	-	-	137.7	35.0	440.9	-	40.1	-	-	-
18	-	-	-	-	1.9	1.0	214.3	-	4.8	-	1.0	-
19	-	0.1	0.1	-	3.6	-	63.5	-	148.7	-	-	-
20	-	0.1	-	-	7.1	-	1068.4	-	28.3	-	-	-
21	15.1	0.4	-	-	15.0	-	1978.3	-	404.6	-	-	-
22	0.2	-	-	-	14.8	-	1289.2	-	162.7	-	-	-
23	-	-	-	-	1.2	0.1	45.4	-	1.7	-	-	-
24	0.2	6.8	-	-	-	-	98.8	51.4	201.6	-	-	-
25	-	7.9	-	-	3.9	-	75.8	-	399.6	-	-	-
26	-	3.9	-	-	3.8	-	249.3	-	146.5	-	-	-
27	-	0.1	-	-	14.9	9.3	157.4	-	5.6	-	-	-
28	-	-	-	-	0.8	1.7	7.8	0.2	0.4	-	-	0.4
29	-	-	-	-	0.2	0.7	4.3	-	1.1	-	-	0.9
30	0.1	-	-	-	14.8	3.7	166.6	-	-	-	-	-
31	-	-	-	-	1.4	-	10.4	1.4	4.5	-	1.4	1.4
32	-	100.5	-	-	10.7	-	46.2	-	42.6	-	-	-
33	0.1	0.8	-	-	0.7	0.4	18.0	-	12.1	-	2.0	0.2
34	0.1	3.9	-	-	7.3	-	409.7	-	54.8	-	-	-
35	5.3	373.3	-	-	-	7.4	81.5	-	66.7	-	-	-
36	2.4	296.9	-	-	7.5	-	120.6	-	48.9	-	3.8	-
37	-	23.3	-	-	16.5	-	108.8	5.5	22.0	-	-	-
38	-	-	-	-	1.5	-	20.5	2.7	9.4	0.2	1.1	-
% occurrence	39.5	55.3	2.6	2.6	89.5	31.6	97.4	13.2	94.7	2.6	31.6	10.5

Table 7 (cont'd)

Set	UMON	UPAR	Total COPE	Total (no eggs)	Total (ALL)
1	-	-	154.1	237.3	252.8
2	-	-	920.9	1377.9	1377.9
3	-	-	1054.4	1223.9	1235.0
4	-	-	9.5	159.4	159.5
5	-	-	191.4	303.6	318.9
6	-	-	924.5	947.4	971.0
7	-	-	603.5	802.3	812.3
8	-	-	192.3	517.0	523.8
9	-	-	315.6	460.2	487.2
10	-	-	557.4	639.4	1451.8
11	-	0.1	238.0	466.8	475.5
12	-	-	1200.2	1275.1	1323.5
13	-	2.2	218.1	493.1	503.7
14	-	0.1	466.1	582.9	633.5
15	-	-	1111.8	1155.7	1155.7
16	-	0.3	362.5	427.4	429.3
17	-	0.3	700.3	839.1	839.3
18	-	-	230.7	240.3	240.3
19	1.8	0.1	225.8	233.5	233.5
20	-	-	1181.7	1191.7	1191.7
21	-	0.2	2529.3	2564.1	2564.1
22	-	0.1	1526.9	1551.4	1551.4
23	-	0.1	51.4	80.3	80.3
24	-	-	432.1	443.8	495.2
25	-	-	501.5	520.5	544.2
26	-	-	405.7	412.7	412.7
27	-	1.9	191.1	258.2	258.2
28	-	0.7	13.4	113.5	113.5
29	0.2	0.2	9.1	85.5	85.9
30	-	-	290.4	419.8	749.5
31	-	0.2	22.0	87.2	203.7
32	-	-	237.0	430.7	849.7
33	-	-	40.2	68.8	89.2
34	-	-	494.9	682.0	689.3
35	-	-	691.5	838.9	927.8
36	-	-	597.1	853.8	1016.7
37	0.1	0.1	216.4	268.2	363.8
38	-	-	39.9	80.9	82.0
% occurrence	7.9	36.8	100.0		

Table 8. Summary of herring stomach fullness (empty, trace, half full or full) and state of digestion (fresh, partly digested, mostly digested or totally digested).

	State of digestion				
Fullness	**1 - fresh**	**2 - partly**	**3 - mostly**	**4 - totally**	**Total**
0+ herring					
0 - empty	-	-	-	108	**108**
1 - trace	1	17	40	46	**104**
2 - half	1	26	47	8	**82**
3 - full	3	27	21	4	**55**
Total	**5**	**70**	**108**	**166**	**349**
1+ herring					
0 - empty	-	-	-	23	**23**
1 - trace	0	6	20	20	**46**
2 - half	2	30	7	1	**40**
3 - full	0	34	4	0	**38**
Total	**2**	**70**	**31**	**44**	**147**

Table 9. Occurrence of food items, as percent of total 0+ herring stomachs with identifiable food items, by set location. Codes described in Tables 5 and 6.

	Fish Egg Inlet	Kwakshua Ch.	Spider Anch.	Kildidt Sound	Thompson Bay	Meyers Pass.	Kitasu Bay	East Higgins Pass	Powell Anch.	Spiller Ch.	Hunter Ch.	Burke Ch.
n	13	9	7	23	27	13	20	18	13	23	8	9
TURB	38.5	33.3	71.4	52.2	33.3	46.2	40.0	50.0	15.4	13.0	25.0	11.1
GAST	-	-	28.6	4.3	3.7	7.7	-	-	-	-	-	-
PELE	-	-	-	-	-	15.4	5.0	-	-	30.4	-	-
CLAD	-	-	14.3	-	-	-	-	-	-	39.1	12.5	22.2
OSTR	7.7	22.2	-	4.3	-	-	-	-	-	-	-	44.4
SHRI	-	-	-	4.3	7.4	-	-	-	7.7	13.0	25.0	-
CRAZ	-	11.1	57.1	26.1	22.2	-	5.0	-	7.7	8.7	25.0	-
CRAM	-	-	-	39.1	-	-	5.0	-	-	8.7	12.5	-
BARN	15.4	11.1	14.3	4.3	-	30.8	5.0	-	30.8	65.2	37.5	22.2
ISOP	-	-	-	-	-	-	-	-	-	-	12.5	-
AMPH	-	-	-	30.4	14.8	-	5.0	5.6	-	21.7	25.0	-
EUPL	-	-	-	-	14.8	-	-	-	-	-	-	-
EUPA	-	-	-	26.1	11.1	38.5	5.0	61.1	-	8.7	-	-
LARV	30.8	11.1	-	-	-	-	-	-	-	4.3	-	55.6
TELA	-	-	-	4.3	-	-	-	-	-	-	-	-
EGGS	53.8	33.3	71.4	34.8	7.4	7.7	15.0	11.1	-	69.6	50.0	11.1
CNAU	-	-	-	-	-	-	5.0	-	-	-	-	-
UCAL	53.8	55.6	85.7	8.7	81.5	15.4	75.0	44.4	7.7	52.2	12.5	88.9
NPLU	-	-	-	-	-	-	-	-	-	-	-	11.1
CALA	7.7	-	-	-	3.7	7.7	-	-	-	-	-	-
CMAR	-	-	-	4.3	3.7	-	5.0	5.6	-	-	-	22.2
CPAC	-	-	-	-	-	-	-	5.6	-	-	-	-
CCOL	-	-	-	-	-	7.7	-	-	-	-	-	-
HTAN	-	-	-	-	-	-	-	-	-	-	-	11.1
MPAC	15.4	-	-	-	14.8	-	5.0	11.1	-	-	12.5	33.3
CGRA	-	-	-	-	-	-	-	5.6	-	-	-	-
SMIN	-	-	-	-	-	-	-	-	-	-	-	11.1
CABD	-	-	28.6	-	11.1	-	-	-	-	8.7	12.5	-
TDIS	15.4	-	-	17.4	14.8	-	20.0	11.1	-	-	-	-
ALON	30.8	-	71.4	4.3	74.1	7.7	45.0	-	-	8.7	25.0	11.1

Table 9 (cont'd)

	Fish Egg Inlet	Kwakshua Ch.	Spider Anch.	Kildidt Sound	Thompson Bay	Meyers Pass.	Kitasu Bay	East Higgins Pass	Powell Anch.	Spiller Ch.	Hunter Ch.	Burke Ch.
PPAR	-	-	-	-	14.8	-	-	5.6	-	13.0	-	33.3
PMIN	23.1	-	42.9	4.3	33.3	7.7	20.0	11.1	-	8.7	-	66.7
UCYC	-	11.1	-	-	-	7.7	5.0	-	-	-	-	-
OITH	7.7	-	-	-	14.8	-	25.0	-	-	-	-	11.1
CANG	7.7	-	-	-	3.7	7.7	-	-	-	-	-	-
UHAR	-	-	14.3	4.3	11.1	15.4	-	22.2	84.6	17.4	12.5	-
UPAR	-	-	-	4.3	-	-	-	-	-	-	-	-

Table 10. Occurrence of food organisms, as percent of total 1+ herring stomachs with identifiable food items, by herring sections. Codes described in Tables 5 and 6.

	Fish Egg Inlet	Kwakshua Ch.	Kildidt Sound	Thompson Bay	East Higgins Pass	Powell Anch.	Spiller Ch.	Hunter Ch.
n	17	5	12	2	17	13	10	27
TURB	29.4	40.0	25.0	50.0	47.1	46.2	30.0	37.0
SHRI	-	-	-	-	-	7.7	10.0	3.7
CRAZ	-	20.0	8.3	-	-	23.1	20.0	14.8
CRAM	-	20.0	-	-	-	7.7	10.0	7.4
BARN	-	20.0	-	-	-	7.7	-	7.4
ISOP	-	-	-	-	-	-	-	3.7
AMPH	-	-	-	-	-	-	-	7.4
EUPA	58.8	-	100.0	100.0	88.2	15.4	90.0	74.1
TELA	-	-	-	-	-	15.4	-	-
EGGS	-	-	-	-	-	-	-	11.1
UCAL	23.5	80.0	-	-	29.4	15.4	40.0	7.4
CALA	11.8	20.0	-	-	-	-	-	-
CMAR	17.6	-	-	-	5.9	-	10.0	-
CPAC	-	-	-	-	-	-	10.0	-
NCRI	-	-	-	-	5.9	-	-	-
HTAN	-	-	-	-	5.9	-	-	-
MPAC	41.2	80.0	-	-	29.4	-	10.0	14.8
TDIS	-	-	-	-	-	7.7	-	-
ALON	5.9	-	-	-	5.9	-	-	-
UHAR	-	-	-	-	-	46.2	-	-
UPAR	-	-	-	-	5.9	-	-	-